

What is claimed is:

1. A pipe system comprising:
  - a pipe arrangement;
  - a sound source device that is connected to the pipe arrangement to supply sound into the pipe arrangement;
  - at least one energy converter that converts energy of an acoustic wave of the sound, which is propagated in the pipe arrangement, into another form of energy; and
  - at least one acoustic wave amplifier/attenuator apparatus that is provided in the pipe arrangement at a corresponding location between the sound source device and a corresponding one of the at least one energy converter and uses thermoacoustic effect to amplify or attenuate the acoustic wave, wherein each acoustic wave amplifier/attenuator apparatus includes:
    - a cold heat exchanger;
    - a hot heat exchanger; and
    - a stack that is held between the cold heat exchanger and the hot heat exchanger.
2. The pipe system according to claim 1, wherein  $\omega\tau$  of the stack of each acoustic wave amplifier/attenuator apparatus is in a range of 1-20.
3. The pipe system according to claim 1, wherein an axial center of the stack of each acoustic wave amplifier/attenuator apparatus is displaced from a node of a standing wave generated

in the pipe arrangement.

4. The pipe system according to claim 1, wherein:

the sound source device is a spontaneous thermoacoustic oscillation generator; and

at least one of the at least one energy converter is a regenerator.

5. The pipe system according to claim 1, wherein each acoustic wave amplifier/attenuator apparatus has an acoustic wave amplification ratio that is greater than a temperature ratio between the hot heat exchanger and the cold heat exchanger of the acoustic wave amplifier/attenuator apparatus.

6. The pipe system according to claim 1, wherein the stack is made of ceramic and has a plurality of parallel flow channels, which axially extend through the stack.

7. The pipe system according to claim 1, wherein:

the at least one energy converter includes a plurality of energy converters;

the at least one acoustic wave amplifier/attenuator apparatus includes a plurality of acoustic wave amplifier/attenuator apparatuses.

8. An acoustic wave amplifier/attenuator apparatus that is arranged in a pipe arrangement, in which an acoustic wave is

propagated, and that uses thermoacoustic effect to amplify or attenuate the acoustic wave, the acoustic wave amplifier/attenuator apparatus comprising:

a cold heat exchanger;

a hot heat exchanger; and

a stack that is held between the cold heat exchanger and the hot heat exchanger.

9. The acoustic wave amplifier/attenuator apparatus according to claim 8, wherein  $\omega\tau$  of the stack is in a range of 1-20.

10. A manufacturing method of a pipe system, the method comprising:

installing a sound source device to a pipe arrangement;

installing at least one energy converter to the pipe arrangement, wherein each energy converter converts energy of an acoustic wave, which is propagated in the pipe arrangement, into another form of energy; and

installing at least one acoustic wave amplifier/attenuator apparatus in the pipe arrangement at a corresponding location between the sound source device and a corresponding one of the at least one energy converter, wherein each acoustic wave amplifier/attenuator apparatus uses thermoacoustic effect to amplify or attenuate the acoustic wave and includes:

a cold heat exchanger;

a hot heat exchanger; and

a stack that is held between the cold heat exchanger and the hot heat exchanger.